Salt-affected soils of south-west Australia: Implications for deep drainage

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Dryland salinity has spread to cover one million hectares in southwest Australia, and while the levels of salinity and their implications for agricultural production have been thoroughly examined, relatively little is known about the characteristics of the salinised soils. Naturally-occurring saline soils exist in this region, but because those soils were of limited interest for agriculture, little research has explored their characteristics either. Strategies to rehabilitate salinised soils, such as deep drainage, need to be guided by a detailed understanding of their properties and their likely response to treatments.

Detailed incremental soil analysis was undertaken on profiles (0-1.45 m depth) at five sites adjacent to deep drains in the following locations of Western Australia: Beynon Rd, Beacon, Morawa, Pithara and Wallatin Creek. The soils vary in salinity levels, pH, texture, and exchangeable cations. Most saline soils at Beynon Rd, Morawa and Wallatin Creek had EC (1:5 water extract) > 200 mS/m, but the Beacon soil was only marginally saline (45 mS/m) at the surface. In general, profiles are alkaline to strongly alkaline in the sub-soil, however, moderately acid topsoil pH occurs at two of these sites. All soils were sodic to strongly sodic in the sub-soil and sodic in topsoil also. Exchangeable Mg levels were similar to or greater than exchangeable Ca. All soils had low organic C levels (<1 %) with the lowest being 0.3 % in Pithara and Beacon soils. Kaolinite and or halloysite were the major minerals present at these sites. Surface layers at most of these sites had more than 70 % sand, except at Wallatin Creek, whereas clay content varied between 14 and 23 % in surface layers. In this paper, we discuss the properties of the salinised soils in relation to those of naturally-occurring saline and sodic soils of southwest Australia, and the prospects of recovery of soil productivity following deep drainage. The responses in productivity of salinised soils to lowering of watertables are expected to vary with the salt levels in the soil, rainfall, soil texture, soil structure, sodicity and site vegetation cover.